Adaptive radiotherapy for virally mediated head and neck cancer

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INTRODUCTION

Clinical investigation has revealed a subgroup of head and neck cancers that are virally mediated. The relationship between nasopharyngeal cancer and Epstein Barr Virus (EBV) has long been established and an association between oropharyngeal cancer and Human Papillomavirus (HPV) has been discovered[1,2]. These cancers often present with nodal involvement and generally respond well to radiation treatment, evidenced by tumour regression[1] (Figure 1). This results in the need for treatment plan adaptation or re-planning in a subset of patients. Adaptive techniques allow the target region of the radiotherapy treatment plan to be altered in accordance with treatment-induced changes to ensure that under or over dosing does not occur[3]. We sought to identify potential risk profiles based on nodal size to be evaluated in a future prospective adaptive radiotherapy trial.

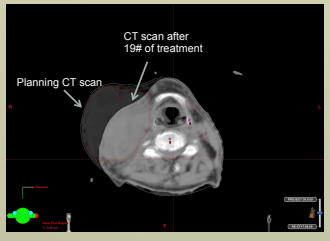


Figure 1 Radiotherapy treatment response of patient with HPV positive head and neck cancer with advanced nodal disease

METHODS

Between 2005-2010, 121 patients with virally mediated, node positive nasopharyngeal (EBV positive) or oropharyngeal (HPV positive) cancers, receiving curative intent radiotherapy treatment were reviewed. Patients were analysed based on maximum size of the dominant node at diagnosis with a view to grouping them in varying risk categories to determine the need of re-planning. Patients who underwent a re-planning scan were further investigated to determine other factors including magnitude of weight loss and primary tumour and nodal tumour regression. The frequency and timing of the re-planning scans was also evaluated.

STATISTICS

The data collected from this study was analysed using the Stata program to identify the factors that may contribute to the need for patients to undergo a re-planning scan. Statistical analysis included basic descriptive statistics and logistic regression to determine the relative contribution of factors such as nodal size and timing of interventions.

RESULTS

Selected characteristics of the patient cohort is demonstrated in Table 1.

- 16 nasopharyngeal and 105 oropharyngeal tumours were reviewed
- 25 (21%) patients underwent re-planning CT at a median of 22 (range, 0-29) fractions

Figure 2 displays the pre-treatment nodal size as a comparison of re-planning scan (re-CT) status. Two patients (one re-CT and one non re-CT) were excluded from this analysis due to their nodal sizes lying greater than 4 standard deviations outside the mean. Specific information relating to those patients who underwent a re-planning scan is described in Table 2.

Based on the analysis, patients were subsequently placed into risk categories based on pre-treatment nodal size:

- Group 1 - ≤35mm
- Group 2 - 36-45mm
- Group 3 - ≥46mm

Applying these risk categories to the patient cohort, re-planning CT's were performed in:

- Group 1- 8/68 (11.8%)
- Group 2- 4/28 (14.3%)
- Group 3- 13/25 (52%)

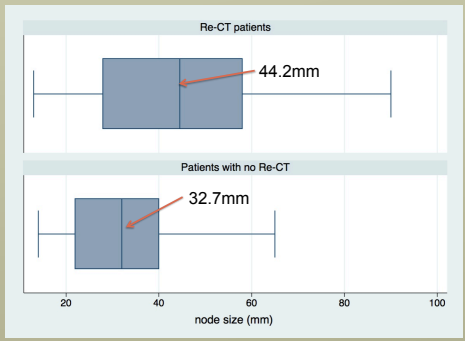
Table 1 Selected patient characteristics

CHARACTERISTIC	NUMBER (n = 121)
Sex	
Male	106
Female	15
Age mean (range)	54 (22-81)
Primary tumour site	
Oropharynx	105
Nasopharynx	16
Smoking history	
Never	39
Former	49
Active	33
Nodal size mean (range)	37.1mm (13mm – 150mm)
Re-planning scan performed	25

Table 2 Selected re-CT patient characteristics

CHARACTERISTIC	NUMBER
Mean initial weight (kg)	82.8
Mean weight at re-CT (kg)	76.9
Mean weight loss (%)	7.1
Mean primary tumour reduction (%)	35.6
Mean nodal tumour reduction (%)	38.5

Figure 2 Box and whisker plot demonstrating nodal size as a function of re-CT status



CONCLUSION

In this series, patients with virally mediated head and neck cancer and nodal size ≥ 46mm appear to be a high-risk group for the need of re-planning during a course of curative radiotherapy. This finding will now be tested in a prospective adaptive radiotherapy study.

REAL WORLD IMPLICATIONS

This research identifies predictive factors for those patients with virally mediated head and neck cancer that will benefit most from treatment adaptation. This will assist in minimising the side effects experienced by these patients thereby improving their quality of life after treatment.

REFERENCES

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